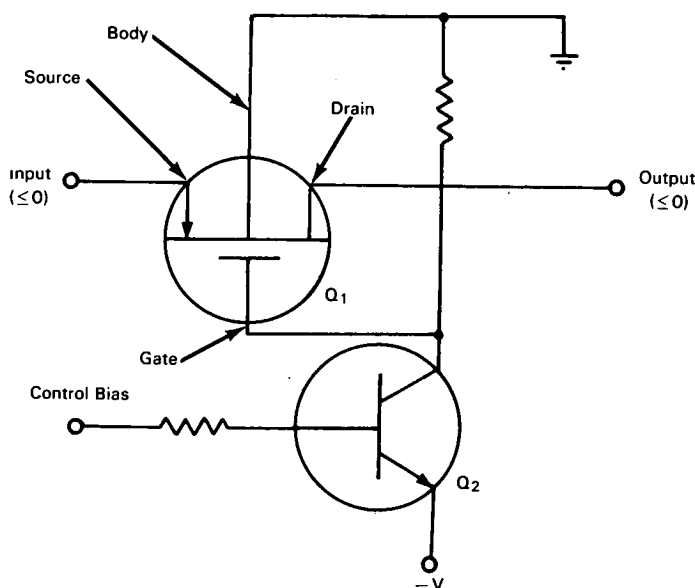


NASA TECH BRIEF



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Field-Effect Transistor Replaces Bulky Transformer in Analog-Gate Circuit



The problem: To design an analog-gate circuit using microelectronic integrated-circuit techniques in order to reduce size and weight. Conventional gate circuits use a heavy, bulky transformer in the drive circuit to isolate the gate from the system fixed voltages.

The solution: A metal-oxide semiconductor field-effect transistor (MOSFET) analog-gate circuit. The MOSFET adapts well to integrated circuits and provides better system isolation than a transformer. System size and weight are appreciably reduced.

How it's done: This analog-gate circuit consists essentially of the MOSFET Q₁, and an NPN control transistor Q₂. With Q₂ in saturation, a conducting

channel is formed from the source of Q₁ to its drain and the analog gate conducts. With Q₂ off, potential on the gate of Q₁ becomes greater than its source or drain potential and the analog gate is open-circuited.

The MOSFET provides complete isolation of the gate elements, resulting in zero offset voltages. Because the input and output signals are less than or equal to zero, the body of Q₁ is grounded and the source and drain junction leakage is kept in the nanoampere range. Body junctions can withstand up to 25 volts without excessive leakage or breakdown, thus permitting a wide range of input voltages. Cross-talk in the MOSFET is minimized by a source-to-drain capacitance of less than 1 picofarad.

(continued overleaf)

Notes:

1. This invention should be of interest to the electronics industry, particularly in the area of telemetry.
2. Inquiries concerning this invention may be directed to:

Technology Utilization Officer
Goddard Space Flight Center
Greenbelt, Maryland, 20771
Reference: B65-10284

Patent status: NASA encourages the immediate commercial use of this invention. Inquiries about obtaining rights for its commercial use may be made to NASA, Code AGP, Washington, D.C., 20546.

Source: Radiation, Incorporated
under contract to
Goddard Space Flight Center
(GSFC-351)